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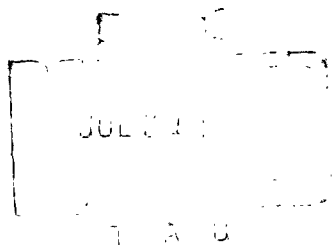
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Technical Research Report 1130

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SCREENING DEVICES FOR SELECTIVE SERVICE

REGISTRANTS WHO FAIL AFQT 7 AND 8



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An activity of the Chief, Research and Development

Charles S. Gersoni  
Colonel, GS  
Commanding

J. E. Uhlaner  
Director, Research Laboratories

Hubert E. Brogden  
Chief Scientist

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(5) 51 6-1  
Technical Research Report, 1130

# SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS WHO FAIL AFQT 7 AND 8,

A. G. Bayroff, E. F. Heermann, and Alan A. Anderson

Submitted by Edmund F. Fuchs  
Chief, Military Selection Research Laboratory

Approved by

  
J. E. Uhlaner  
Director, Research Laboratories

  
Hubert E. Brogden  
Chief Scientist

  
Charles S. Gersoni  
Colonel, GS  
Commanding

Army Project Number  
OJ95-60-001

Induction a-31

January 1963

## PREFACE

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The present publication reports on a portion of the INDUCTION Task, which is responsive to special requirements of the Department of Defense AFES Policy Board, the Assistant Secretary of Defense (Manpower), and the Deputy Chief of Staff for Personnel.

Congressional legislation has laid down the basis for procedures to screen service input so that those who lack military trainability may be rejected. Successive forms of the Armed Forces Qualification Test (AFQT) meet the requirements for an overall screening measure. The Army Qualification Battery (AQB) is a group of short tests to permit identification of specific abilities of men marginally acceptable on AFQT or of men who seek enlistment for specific training programs.

Current research embraces the following activities: (1) devising methods to increase the effectiveness of overall screening through new tests and test content; (2) improving the effectiveness of short tests for the differential measurement of aptitude areas for the middle ability level; (3) exploring the feasibility of very short, limited-range tests; and (4) devising new approaches to the detection of deliberate failures.

## SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS WHO FAIL AFQT 7 AND 8

### BRIEF

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#### Requirement:

To develop special devices for detecting deliberate attempts to fail the Armed Forces Qualification Test AFQT 7 and AFQT 8.

#### Procedure:

Special scoring devices termed "failure keys" were developed based on differences in the responses of true failures on AFQT (those who try to pass the test but lack the necessary ability) and those who deliberately attempt to fail.

#### Findings:

When the special scoring was applied to experimental samples, the newly constructed failure keys provided even more efficient identification of deliberate failures and true failures than did similar devices used with prior AFQT forms and left a smaller percentage of AFQT failures uncategorized.

#### Utilization of Findings:

The failure keys developed in the present study were made operational on 1 July 1960 along with AFQT 7 and AFQT 8.



SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS  
WHO FAIL AFQT 7 AND 8

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## SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS WHO FAIL AFQT 7 AND 8

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### BACKGROUND AND PURPOSE

The Armed Forces Qualification Test (AFQT) is the mental test used at Armed Forces Examining Stations by all the services as the primary mental screening measure for both applicants for enlistment and Selective Service registrants. Score on the AFQT is used as an indication of potential for successfully completing basic training and for profiting from subsequent military training.

The qualifying score for applicants (currently the 31st percentile) is higher than for registrants (10th percentile). Applicants who fail are rejected without further screening, on the assumption that they have tried to do their best on the test. Some registrants, however, may deliberately attempt to fail the test as a means of avoiding military service. To detect attempts at deliberate failure, all registrants who fail to achieve a passing score on AFQT are subjected to further screening by which acceptance or rejection is finally determined.

As a first step in the terminal screening process, special scoring devices termed "failure keys" are applied to AFQT answer sheets. Special tests and an intensive interview designed to detect evidence of ability to pass the AFQT are applied in doubtful cases.

Although the need for detecting deliberate failures is not acute from a manpower standpoint when there is no national emergency, appropriate methods must be readily available. In addition, it is considered important to prevent successful evasion of military service through deliberate failure on the part of a small number of examinees. There is also need to insure that true failures, that is, men who fail AFQT because they genuinely lack the minimum mental ability, are not accepted for service. Therefore, when AFQT 7 and 8<sup>1/</sup> were being readied for introduction as the screening test to succeed AFQT 5 and 6, research was conducted to develop failure keys for the new tests and to estimate the efficiency of the keys in classifying as either true failures or deliberate failures those individuals failing to achieve a passing score.

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<sup>1/</sup> AFQT 7 and 8 were made operational 1 July 1960.

## DEVELOPING THE FAILURE KEYS

The rationale underlying the development of failure keys is that AFQT true failures--men trying to do well but unable to pass the test--select different responses to test questions than do those deliberately seeking to fail the test, irrespective of whether the responses are right or wrong. The typical patterns of responses of the two groups are unlikely to correspond.

In developing failure keys for AFQT 7 and 8, two experimental groups of examinees were established, one of true failures and the other of deliberate failures. The true failure sample consisted of 800 AFQT 5-6 failures. These men were Selective Service registrants classed as true failures on the basis of operational terminal screening procedures. There was wide geographic representation in the sample, data being collected at 16 Armed Forces Examining Stations:

New York, New York	Montgomery, Alabama
Newark, New Jersey	New Orleans, Louisiana
Baltimore, Maryland	Houston, Texas
Louisville, Kentucky	Dallas, Texas
Charlotte, North Carolina	San Antonio, Texas
Raleigh, North Carolina	Chicago, Illinois
Columbia, South Carolina	Denver, Colorado
Atlanta, Georgia	Oakland, California

The deliberate failure sample consisted of 1600 enlisted men whose recorded operational AFQT 5-6 scores were in the 31-92 percentile range. These men, having passed AFQT 5-6, were given AFQT 7 or AFQT 8 with the instruction: "Try and fail the test. . . as if you were going to try to beat the draft." Data were collected at four installations:

Fort Dix, New Jersey  
Fort Knox, Kentucky  
Fort Jackson, South Carolina  
Fort Carson, Colorado

By analyzing responses of the two groups, two sets of questions were earmarked, one containing responses preferred by the true failures, the other containing responses preferred by the deliberate failures. Subkeys reflecting the differing responses were established and used in combination to place the examinee in one of three categories: true failures, deliberate failures, or undetermined. The keys were then applied to different groups of examinees to verify the effectiveness of the scores in categorizing the men. A standard of comparison was the effectiveness of the AFQT 5 and 6 failure keys then in operational use.

## ESTABLISHING CUTTING SCORES

The final phase of the research was analysis of the distributions of failure key scores to set cutting points so as to discriminate effectively between true and deliberate failures.

Each failure key is composed of a true failure subkey based on responses preferred by the true failures in 25 items and a deliberate failure subkey based on responses preferred by the experimental deliberate failures in 25 items. The final score is the deliberate failure score minus the true failure score. Men with scores of plus 10 or above are designated deliberate failures. The cutting score for deliberate failure was set so that less than 1 percent of true failures would be misclassified as deliberate failures. Men with scores of minus 3 and below are designated true failures. Those with scores from minus 2 through plus 9 are in the undetermined category. Deliberate failures and those in the undetermined category are examined further in the terminal screening procedure.

## EFFECTIVENESS OF THE FAILURE KEYS

The keys were found to differentiate successfully between true failures and deliberate failures and hence were recommended for use at Armed Forces Examining Stations in the initial identification of deliberate failures. In identifying the true failures as well as those deliberately failing, the keys contribute to insuring that men of genuinely low mental ability are not accepted for service.

On both AFQT 7 and 8, when the failure keys were applied to tryout samples, approximately 85 percent of the true failures were classified as true failures and 15 percent were left undetermined. The number of true failures classified as deliberate failures was negligible, meeting the objective of less than one percent. Of the deliberate failures in the tryout samples, 72 percent on AFQT 7 and 76 percent on AFQT 8 were correctly classified as deliberate failures, while 21 percent and 19 percent, respectively, were left undetermined. On AFQT 7, 7 percent were misclassified as true failures; on AFQT 8, misclassifications amounted to 5 percent. These figures indicate that the failure keys were highly accurate in identifying true failures and exceedingly effective in the preliminary identification of deliberate failures early in the terminal screening process.

As compared with the failure keys for AFQT 5 and 6, the AFQT 7 and 8 failure keys, used with the newly established cutting scores, improved upon the already effective identification of true failures and improved greatly on the identification of deliberate failures. Concomitantly, the proportions left undetermined were reduced. At the same time, the low rates of misidentification of true failures as deliberate, and vice versa, were maintained.

SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS  
WHO FAIL AFQT 7 AND 8

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TECHNICAL SUPPLEMENT

# TECHNICAL SUPPLEMENT

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## SAMPLING

### Definition of the Criterion Groups

The criterion for the development and cross-validation of the failure subkeys was the dichotomous variable true failure vs deliberate failure on AFQT. Sampling was based on scores obtained on AFQT 5-6 for which failure keys were in operational use.

True failures. In developing failure keys for previous forms of the AFQT, the true failure sample had been selected mainly from applicants for enlistment who failed to achieve a passing score (10th percentile) on AFQT. Since applicants for enlistment are seeking military service voluntarily, those applicants who failed could be considered genuine--not deliberate--failures. The Enlistment Screening Test, the instrument used to reduce the number of potential AFQT failures channeled to the Armed Forces Examining Stations, was suspended during the period of data collection. However, since the development of the AFQT 5 and 6 failure keys, the AFQT qualifying score for enlistees had been raised to the 31st percentile. Suspension of prescreening would have sent to AFES large numbers of applicants who would fail AFQT. Accordingly, a more feasible method of obtaining failure cases was required for the current research.

Selective Service registrants classified as true failures as a result of terminal screening procedures therefore made up the true failure sample. In all, data for 665 true failure cases were obtained for the present study. It was fully recognized that such a sample would introduce some bias in that procedures for detecting deliberate failures--and eliminating them from the sample in question--involved instruments equivalent to those being developed. Since the terminal screening involved additional procedures for doubtful cases and the number of undetected deliberate failures was believed to be small (as estimated from the less than 1% administratively accepted), the extent of this bias could be safely ignored.

Deliberate failures. The deliberate failure sample was taken from 2000 enlisted men examined at four Army installations--Fort Dix, Fort Knox, Fort Jackson, and Fort Carson--whose recorded operational AFQT 5 or AFQT 6 scores were in the 31 - 100 percentile range. Category IV men, with AFQT scores from 10 to 30, were excluded in order to avoid identifying as deliberate failures men who at best would be only marginally useful in the service. The men in the sample, having already passed the

AFQT 5-6, were given AFQT 7 or AFQT 8 with the instruction to "try and fail the test . . . as if you were going to try to beat the draft." Examinees were tested with AFQT 7 or 8 either during reception processing or during the early weeks of basic training.

Prior studies had indicated that experimental deliberate failures tend to select incorrect responses for very easy items whereas true failures tend to select correct responses for these items. A preliminary survey of response patterns in the present study showed these findings to prevail except for Category I men, with AFQT scores from 93 to 100. Since inclusion of deliberate failures in this category would decrease the discriminative function of the keys, all AFQT Category I men were eliminated from the deliberate failure sample.

### Constituting the Samples

To facilitate statistical computations, the total samples were reduced to 300 true failures and 1600 deliberate failures, that is, 400 true failures and 300 deliberate failures for each AFQT form. These complete samples were used in item analysis to construct a true failure subkey and a deliberate failure subkey for each form. For these subkeys, no samples were available for cross-validation.

For each form, the 400-case true failure sample was then divided into two 200-case samples in which two additional true failure subkeys were derived. The 300-case deliberate failure sample was similarly divided into two 150-case samples in which two deliberate failure subkeys were derived. To provide estimates of shrinkage to be expected in new samples, a dual cross-validation design was used on the two halves of the complete sample for each form (table 1). Each of the 100-case samples was stratified to represent the mobilization population.

Table 1

ITEM ANALYSIS SAMPLES FOR THE DEVELOPMENT OF AFQT 7 AND 8 FAILURE KEYS

	AFQT-7			AFQT-8		
	I <sup>a</sup>	II <sup>a</sup>	Totals	III <sup>b</sup>	IV <sup>b</sup>	Totals
True Failures	200	200	400	200	200	400
Deliberate Failures	400	400	800	400	400	800
Totals	600	600	1200	600	600	1200

<sup>a</sup> Samples I and II were utilized in a dual cross-validation design for AFQT 7 failure keys and subkeys.

<sup>b</sup> Samples III and IV were utilized in a dual cross-validation design for AFQT 8 failure keys and subkeys.

### Item Analysis and Identification of Items for Keying

On the basis of prior experience, 25 responses were identified for each subkey. The distribution of item statistics in the present study gave no cause to lengthen or to shorten the keys.

Alternatives for true and deliberate failure subkeys were selected on the basis of the magnitude and sign of their phi coefficient with the criterion. The criterion against which items and keys were developed, and subkeys and keys validated, was the dichotomous variable deliberate failure (coded + 1) vs true failure (coded 0). No alternative was selected unless it had a phi of .30 or higher. A negative phi indicated an alternative preferred by true failures, a positive phi an alternative preferred by deliberate failures. For the true failure key, alternatives were selected, for the most part, from the easier items because the easier items were found to be more discriminating.

### Validity Analysis and Selection of Keys for Operational Use

The experimental variables developed for the present study are listed in Table 2.

Back-validity and cross-validity coefficients of the subkeys and failure keys shown in Table 3 were point biserial coefficients. Inter-correlations among the subkeys (Tables 4 and 5) were product moment coefficients.

Back-validity coefficients of subkeys and keys were of nearly the same magnitude as the cross-validity coefficients. In two cases, the cross-validity coefficients were slightly higher. The true failure subkeys yielded somewhat higher back-validity coefficients and cross-validity coefficients than did the deliberate failure subkeys. The equivalence of the back- and cross-validity estimates in the half samples indicates that the coefficients obtained for the full samples can be expected to hold up in new samples without noticeable shrinkage.

The correlation coefficients shown in Table 3 are useful indications of the relative effectiveness of the experimental keys. However, the criterion dichotomy established in the samples provided twice as many deliberate failure cases as true failure cases. On the basis of operational reports, it may be expected that no more than 1 percent of the mobilization base would be deliberate failures, whereas 10 percent would be expected to be true failures. With a given set of score means and standard deviations for the subgroups, the projected real dichotomy of 1 to 10--or even more extreme--would result in smaller validity coefficients than those reported for the experimental dichotomy of 2 to 1. The reported coefficients are, however, on a comparable basis to those reported for similar analysis of prior failure keys.



Even though the failure keys developed in the total item analysis samples were not, in the strictest sense, cross-validated, shrinkage was either very slight or nonexistent and the validity coefficients can be taken pretty much as they stand. Certainly, the key developed in the total sample can be assumed to be as valid as the keys developed in samples one-half the size. For example, in Table 3, the validity of variable 13 can be taken as the lower limit of the validity of variable 17. Accordingly, the failure keys developed in the total item analysis samples (variables 17 and 18) were recommended for use as the operational failure keys for AFQT 7 and AFQT 8 respectively.

#### **Establishing Cutting Scores**

Cutting scores were selected after inspecting the frequency distributions of the failure key scores. To allow for unreliability in the failure key scores, it was necessary to establish a zone between the deliberate and true failure categories where classification was doubtful, that is, an undetermined category. An important consideration in setting the cutting scores was the fact that it would not be in the best interests of the Armed Services to accept administratively any large numbers of mentally unqualified individuals. Hence, the cutting score for the deliberate failure category was set so that less than one percent of the true failures would be misclassified as deliberate failures. The percentage of deliberate failures misclassified as true failures did not have the same degree of importance to the Services. If an individual obtains a failure key score falling within the limits of the undetermined category, additional screening procedures are applied to determine his categorization.

To compare the relative efficiency of the AFQT 7 and AFQT 8 failure keys and cutting scores with those for AFQT 5 and AFQT 6, Tables 6 and 7 were prepared. The newly developed AFQT 7 and 8 keys improved on the already effective identification of true failures, improved greatly on the identification of deliberate failures, and reduced the proportion left in the undetermined category. At the same time, the low rates of misidentification of true failures as deliberate failures and vice versa were maintained.

Table 2  
EXPERIMENTAL VARIABLES

Variable No.	Type of key or subkey	Sample Utilized to Develop	Cross-Validation Sample
1	AFQT 7 TF Subkey	I + II	none
2	AFQT 8 TF "	III + IV	none
3	AFQT 7 DF "	I + II	none
4	AFQT 8 DF "	III + IV	none
5	AFQT 7 TF "	I	II
6	AFQT 7 TF "	II	I
7	AFQT 7 DF "	I	II
8	AFQT 7 DF "	II	I
9	AFQT 8 TF "	III	IV
10	AFQT 8 TF "	IV	III
11	AFQT 8 DF "	III	IV
12	AFQT 8 DF "	IV	III
13	AFQT 7 Failure key (Var 7 minus 5)	I	II
14	AFQT 7 Failure key (Var 8 minus 6)	II	I
15	AFQT 8 Failure key (Var 11 minus 9)	III	IV
16	AFQT 8 Failure key (Var 12 minus 10)	IV	III
17	AFQT 7 Failure key (Var 3 minus 1)	I + II	none
18	AFQT 8 Failure key (Var 4 minus 2)	III + IV	none

Table 3

## BACK AND CROSS-VALIDITY COEFFICIENTS OF EXPERIMENTAL VARIABLES

<u>Variable No.</u>	<u>Type of Key</u>	<u>Back Validity</u>	<u>Cross Validity</u>
1	AFQT 7 TF Subkey	-.84	_____
2	AFQT 8 TF Subkey	-.82	_____
3	AFQT 7 DF Subkey	.79	_____
4	AFQT 8 DF Subkey	.74	_____
5	AFQT 7 TF Subkey	-.85	-.83
6	AFQT 7 TF Subkey	-.33	-.85
7	AFQT 7 DF Subkey	.76	.75
8	AFQT 7 DF Subkey	.77	.76
9	AFQT 8 TF Subkey	-.83	-.81
10	AFQT 8 TF Subkey	-.83	-.82
11	AFQT 8 DF Subkey	.71	.70
12	AFQT 8 DF Subkey	.73	.70
13	AFQT 7 Failure key (Var 7 minus 5)	.83	.82
14	AFQT 7 Failure key (Var 8 minus 6)	.83	.84
15	AFQT 8 Failure key (Var 11 minus 9)	.80	.79
16	AFQT 8 Failure key (Var 12 minus 10)	.81	.79
17	AFQT 7 Failure key (Var 3 minus 1)	.84	_____
18	AFQT 8 Failure key (Var 4 minus 2)	.81	_____

Table 4  
INTERCORRELATIONS OF SUBKEYS FOR AFQT 7  
(N = 1200)

Variable	Var. No.	5	6	7	8
True Failure subkey derived in Sample I	5	1.00	.98	-.84	-.84
True Failure subkey derived in Sample II	6	-	1.00	-.84	-.84
Deliberate Failure subkey derived in Sample I	7	-	-	1.00	.96
Deliberate Failure subkey derived in Sample II	8	-	-	-	1.00

Table 5  
INTERCORRELATIONS OF SUBKEYS FOR AFQT 8  
(N = 1200)

Variable	Var. No.	9	10	11	12
True Failure subkey derived in Sample III	9	1.00	.99	-.83	-.85
True Failure subkey derived in Sample IV	10	-	1.00	-.83	-.85
Deliberate Failure subkey derived in Sample III	11	-	-	1.00	.97
Deliberate Failure subkey derived in Sample IV	12	-	-	-	1.00

Table 6

PERCENTAGES OF TRUE FAILURES AND DELIBERATE FAILURES IN EACH OF  
THREE CATEGORIES AS CLASSIFIED BY AFQT 7 AND 8 FAILURE KEYS

Classified as	Score on Failure Key	AFQT 7		AFQT 8	
		% of true failure sample	% of deliberate failure sample	% of true failure sample	% of deliberate failure sample
Deliberate failures	10 and above	0.5	71.5	0.3	76.1
Undetermined	-2 to 9 incl.	13.7	21.1	14.5	18.9
True failures	-3 and below	85.8	7.3	85.2	5.0
		<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

Table 7

PERCENTAGES OF TRUE FAILURES AND DELIBERATE FAILURES IN EACH OF  
THREE CATEGORIES AS CLASSIFIED BY AFQT 5 and 6 FAILURE KEYS

Classified as	Score on Failure Key	AFQT 5		AFQT 6	
		% of true failure sample	% of deliberate failure sample	% of true failure sample	% of deliberate failure sample
Deliberate failures	5 and above	0.6	45.8	0.3	47.9
Undetermined	-7 to 4 incl.	18.8	48.0	27.1	46.8
True failures	-8 and below	80.6	6.2	72.6	5.3
		<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

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Technical Research Report 976. November 1952.

AD	23/1. 28/4	UNCLASSIFIED Human Resources Research --Personnel Measurement	U.S. Army Personnel Research Office, OORD, DA SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS WHO FAIL AFQT 7 and 8 by A. G. Bayroff, E. F. Heermann, and Alan A. Anderson. January 1963. Rept. on Induction a-31 Proj.-- 22 pp incl 7 tables 19 Ref. (USAPRO Technical Research Report No. 1130) (DA Project QJ95-60-001) Unclassified Report	UNCLASSIFIED Human Resources Research --Personnel Measurement	AD	23/1. 28/4	U.S. Army Personnel Research Office, OORD, DA SCREENING DEVICES FOR SELECTIVE SERVICE REGISTRANTS WHO FAIL AFQT 7 and 8 by A. G. Bayroff, E. F. Heermann, and Alan A. Anderson. January 1963. Rept. on Induction a-31 Proj.-- 22 pp incl 7 tables 19 Ref. (USAPRO Technical Research Report No. 1130) (DA Project QJ95-60-001) Unclassified Report	UNCLASSIFIED Human Resources Research --Personnel Measurement
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